the hepatic rat metabolic pathway of oxidized LDL and Lp (a) is common. This phenomenon suggests also that the impairment of Kupffer cell removal of both oxidized LDL and Lp (a) may favor atherogenesis.

965 Myocardium Hypertrophy and Function in Hypertension

Monday, March 17, 1997, 3:00 p.m.–5:00 p.m.
Anaheim Convention Center, Hall E
Presentation Hour: 4:00 p.m.–5:00 p.m.

965-77 Plasma BNP and N-terminal ANP concentrations in individuals with ECG evidence of LVH: a population based study

S.D. Robb, T.A. McDonagh, J. Byrne, J.J. Morton, J.J.V. McMurray, H.J. Dargie. *Western Infirmary, Glasgow, Scotland, UK*

Brain natriuretic peptide (BNP), produced by the ventricular myocardium, may be elevated in the plasma of individuals with left ventricular hypertrophy (LVH) whereas N-terminal atrial natriuretic peptide (NT-ANP), produced by the atria, may be unaffected. We looked at BNP, NT-ANP level and correlated them with ECG criteria for LVH on a Minnesota-coded ECG and blood pressure in 626 persons aged 55 to 75 years randomly selected from the population of North Glasgow. All had a left ventricular ejection fraction (LVEF) by echocardiography of > 40%. The mean LVEF for those with (n = 87) and for those without LVH (n = 539) on their ECG was not significantly different (52.0% v 51.6%). The systolic and diastolic blood pressures were higher in the LVH group (162/85 mmHg v 144/79 mmHg $p < 0.001$).

The mean plasma BNP concentrations were higher in those with LVH (20.5 pg/ml v 15.8 pg/ml; $p = 0.04$). NT-ANP concentrations, however, were not elevated in those with LVH. A plasma BNP concentration of 14.8 pg/ml has a sensitivity of 0.61 and a specificity of 0.61 for identifying an ECG abnormality of LVH; sensitivity and specificity for echocardiographic LVH are being evaluated.

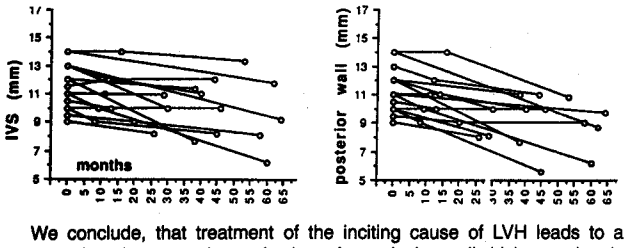
A raised systolic, but not diastolic BP, was independently associated with a raised BNP concentration. Those with a systolic BP ≥ 160 mmHg had a mean plasma BNP concentration of 20.3 pg/ml compared to 15.1 pg/ml in normotensives ($p < 0.001$).

Patients with LVH have increased plasma BNP but not NT-ANP concentrations in keeping with the ventricular origin of BNP. This differs from patients with impaired LV systolic function who have elevations of both NT-ANP and BNP.

965-78 Natural Time Course of Regression of Left Ventricular Hypertrophy

T. Stefenelli, C. Abela, H. Frank, J. Strametz, S. Globits, B. Niederle. *University of Vienna, Austria*

Primary hyperparathyroidism (PHPT) may induce left ventricular hypertrophy (LVH) that is reversible after successful parathyroidectomy (PTX). Thus, these patients represent an ideal cohort to analyse the 'natural' time course of regression of LVH. We performed echocardiographic studies in 16 normotensive PHPT patients (resting blood pressure: 130 ± 5/78 ± 4 mmHg) with normal systolic left ventricular function, no valvular disease, and no medication prior to PTX, as well as 12.5 ± 5 (I) and 45.7 ± 13 months (II) after PTX. At baseline, 11 patients (69%) disclosed LVH (end-diastolic wall thickness of the interventricular septum (IVS) and posterior wall (PW) ≥ 11 mm). Removal of the inciting disease was followed by long-lasting regression of LVH: IVS: −0.68 mm (I) and −1.69 mm (II, $p = 0.02$); PW: −0.46 mm (I) and −2.24 mm (II, $p = 0.02$).



We conclude, that treatment of the inciting cause of LVH leads to a prolonged and progressive reduction of ventricular wall thickness that is not completed within 12 months. LVH regression studies or meta-analyses compairing the effect of therapeutic strategies at different times of observation should be interpreted with caution.

965-79 Exercise-Induced Myocardial Ischemia in Hypertensive Patients with Angiographically Normal Coronary Arteries

Y. Shigematsu, M. Hamada, T. Ohtsuka, S. Ikeda, H. Hashida, T. Kuwahara, Y. Hara, K. Kodama, K. Hiwada. *Ehime University, Ehime, Japan*

In the clinical setting, we often encounter hypertensive patients with angiographically normal coronary arteries who show exercise-induced perfusion defect [redistribution (RD)] in thallium myocardial scintigraphy. Therfore, the purpose of this study is to elucidate the cause of exercise-induced myocardial ischemia in hypertensive patients with angiographically normal coronary arteries. Of 39 hypertensive patients (HT) with angiographically normal coronary arteries included in this study, 25 showed RD in exercise thallium scintigraphy [HT-RD(+)] (60 ± 10 yrs), and 14 did not show RD [HT-RD(−)] (59 ± 9). Coronary vasomotor response to acetylcholine, echocardiographically determined left ventricular hypertrophy and geometry, left ventricular performance and prevalence of coronary risk factors were compared between two groups. 1) The prevalence of coronary vasospasm in HT-RD(+) [15/24, 63%] was significantly higher than that in HT-RD(−) [2/15, 13%]. RD area nearly coincided with site of coronary vasospasm. 2) There were no significant differences in office blood pressure, total cholesterol levels and HDL-cholesterol levels between two groups. 3) There were no significant differences in left ventricular mass index (122 ± 25 vs 118 ± 35 g/m2) and relative wall thickness (0.41 ± 0.09 vs 0.41 ± 0.10) between two groups. 4) There were also no significant differences in cardiac index (3.47 ± 0.84 vs 3.82 ± 0.66 L/min/m2) and left ventricular end-diastolic pressure (12 ± 2 vs 13 ± 3 mmHg) between two groups. In conclusion, exercise-induced myocardial ischemia in hypertensive patients with angiographically normal coronary arteries is, at least in part, associated with disturbed coronary vasomotor response to exercise.

965-80 Echocardiographic Evidence of Transmural Contraction Gradient: the Role of Ventricular Geometry to Maintain Normal Chamber Function in Human Hypertension

G. de Simone, A. Ganau, M.J. Roman, R.B. Devereux. *Cornell Medical Center, New York, NY, USA*

Studies with tagging MRI have shown that wall thickening at the endocardium exceeds cross-fiber shortening of both sub-endocardial and sub-epicardial fibers, because of fiber interaction. This interaction can work as a compensatory mechanism to amplify at the chamber level reduced midwall fiber shortening. Echocardiograms (2D and M-Mode) were obtained in 50 normotensive (nmts) and 50 age-matched untreated hypertensive subjects (hpts) and diastolic wall thickness (wt) was divided into 10 layers. Hpts exhibited reduced midwall shortening ($p < 0.001$ vs nmts). Near the endocardium (at the inner 10% of diastolic wt), systolic increase in cross-sectional area (CSA) was similar in nmts (51.5%) and hpts (49.2%) and decreased from endocardium to epicardium in both hpts and nmts. Systolic increase in CSA began to be lower in hpts from 30% of diastolic wt (30.8% vs 33.3% in nmts, $p < 0.02$) to the epicardial layer (11.6% vs 13.3% in nmts, $p < 0.001$). As compared to nmts, in hpts systolic increase in CSA was reduced by 4% at the endocardium (p = ns) and by 13% at the epicardial layer ($p < 0.001$). The ratio of endocardial/epicardial systolic change in CSA was positively related to relative wt (both groups $p < 0.002$). Thus, evaluation of systolic increase in CSA in different layers of diastolic LV wt shows a progressive additional effect of the external layers to augment thickening of inner shells. CSA at the inner 10 or 20% of diastolic wt increases in systole more than would be predicted by the fiber shortening at the epicardium. Therefore, the ability to generate sufficient strength to reduce LV minor-axis to sustain ejection is a function of LV wall thickness, which allows hpts to maintain normal chamber mechanics despite reduced midwall circumferential shortening.

965-81 Left Ventricular Posterior Wall 2-D Mode Cardiac Ultrasound Measurements are the Most Sensitive of Devereux's Left Ventricular Mass Formula Parameters to Detect Treatment Effects in Hypertensive Patients

W.F. Terpstra, W.F. Heesen, S. Nauta, E. de Groot, P.A. de Graeff, A.J. Smit, J.F. May. *Groningen Academic Hospital and Groningen Hypertension Service, Groningen, the Netherlands*

Devereux's Left Ventricular Mass (LV Mass) estimate uses Intra Ventricular Septum (IVS), End Diastolic Diameter (EDD), and Left Ventricular Posterior Wall (LVPW) 2D-mode cardiac ultrasound measurements. To investigate which of these parameters is most likely to detect antihypertensive treatment effects in comparative medical intervention trials, for each of the parameters

the differences between a newly diagnosed, untreated group of hypertensive patients (HYP, N = 149, SBP185(SD10)/DBP 93 (6) mmHg. were compared to those of a group of normotensive controls (CON, N = 49, 141(11)/79 (7) mmHg. From intra sonographer studies in 10 subjects the SD's of the means of the paired differences of each of the parameters were calculated.

The IVS, EDD and LVPW were 10.1 (1.2), 44.8 (3.9) and 10.2 (1.1) mm. in the HYP group, and 8.6 (1.0), 43.5 (4.5) and 8.4 (0.9) mm. in the CON group, respectively ($\delta_{HYP-CON}$'s 1.5, 1.3 and 1.8 mm.). The SD's of the means of the paired differences of the intra sonographer data were 0.46, 1.14, and 0.31 mm. for the IVS, EDD, and LVPW measurements, respectively.

LVPW not only showed the largest $\delta_{HYP-CON}$, but also the smallest measurement variability. Of the three parameters determining LV Mass, the LVPW may be the most sensitive to show antihypertensive treatment effects in comparative 2D-mode cardiac ultrasound studies.

965-82 Determinants of Midwall Fractional Shortening in Healthy, Normotensive Youth With Family History of Hypertension

G.A. Mensah, K.A. Murdison, F. Treiber, H. Davis, W. Thompson, W.B. Strong. *Medical College of Georgia, Augusta, GA, USA*

Midwall fractional shortening (mFS) identifies adult hypertensives with impaired systolic performance previously undetected by use of endocardial shortening indices. mFS also predicts cardiovascular morbidity and mortality. Determinants of mFS have not been studied in youth at risk for essential hypertension (EH). To evaluate this, we studied 109 healthy, normotensive youth with a family history of EH (mean age 12.9 ± 2.9 years at initial visit; 68% African-American (AAs); 47% female) at 2 visits, an average of 2.5 years apart. Anthropometric variables, heart rate, SBP, DBP, cardiac output (CO), and total peripheral resistance (TPR) were measured at rest and before, during, and after each of 4 physical/behavioral stressors. At each visit, M-mode echocardiography was used to obtain LV dimensions for calculation of mFS and circumferential end-systolic stress (cESS). We examined the relations between baseline variables and follow-up ($_{FU}$) mFS and cESS using univariate and multiple regression techniques. *Results:* mFS_{FU} was significantly related to baseline mFS, ethnicity, conicity, weight, resting TPR, and CO reactivity to parent-child discussion (CO-RPCD; r range = −0.28 to 0.20, ps < 0.05). Independent predictors of mFS_{FU} were initial mFS, weight, and CO-RPCD (total model R^2 = 0.16, p < 0.001). $cESS_{FU}$ was related to ethnicity, gender, and initial cESS, weight, body surface area, resting SBP, and CO reactivity to postural change (r range = −0.36 to 0.33, all ps < 0.05). $cESS_{FU}$ was predicted by initial cESS, weight, and gender (total model R^2 = 0.16 to 0.20, p < 0.001). *Conclusions:* Gender, weight, and hemodynamic reactivity to stressors independently predicted future mFS and cESS, as did the baseline mFS and cESS. African-American youth had a significantly lower mFS relative to Caucasians.

965-97 Early Cardiac Changes in Children with Arterial Hypertension

G. de Simone, R.B. Devereux, G.F. Mureddu, R. Greco, A. Franzese, F. Contaldo. *University Federico II, Naples, Italy, Cornell Medical Center, New York, NY, USA*

To determine whether arterial hypertension cause LV abnormalities in young children similar to those found in adults, 190 6 to 11 year old children (77 girls) have been studied in a school-site in Naples, Italy, by limited echocardiography and bioelectric impedance (to calculate fat-free body mass (FFM). Blood pressure (BP) was high (from Italian Tables of BP) in 34 children (hpts, 18%, 9 girls, 133 ± 8/81 ± 10 mmHg) and obesity was present in 44 (23%, 15 girls). Gender and age-independent risk of hypertension was 2.8 fold (odds ratio) greater in obese than normal-weight children (1.3–6.3, p < 0.01). LV mass was higher in hpts as both absolute value and normalized for height$^{2.7}$ or FFM (all p < 0.01). Relative wall thickness was also increased in hpts (p < 0.01). Prevalence of LV hypertrophy was 21% among hpts (p < 0.004, vs 4.3% in normals). Risk of LV hypertrophy was 5.5-fold higher in the presence of hypertension (p < 0.004), whereas obesity, age and gender did not have independent effects. Endocardial (e) shortening (S) was slightly higher in hpts (36.8 ± 8.2% vs 34.3 ± 4.8% in normals, p < 0.02), whereas midwall (m) S was identical in the two groups (both 20.2%). Both eS and mS were negatively related to cESS (r = −0.62, SEE = 3.8% and r = −0.32, SEE = 2.4% in normals). The value of eS as percentage of predicted from cESS was increased in hpts (p < 0.001), whereas that of mS was normal. Thus, 1) early hypertension in school children is associated with LV geometric abnormalities similar to those found in hypertensive adults (LV hypertrophy, concentric pattern); 2) similar to adult hypertension, endocardial chamber function is supranormal; 3) in contrast to findings in adults, midwall shortening is still normal in hypertensive children.

965-98 Left Ventricular Diastolic Dysfunction in Hypertension Is Associated With Autonomic Imbalance

M.V. Pitzalis, F. Mastropasqua, A. Passantino, A. Mannarini, F. Massari, N. Di Venere, R. Colombo, G. Antonelli, P. Rizzon. *Cardiology Institute, Bari University. Cardiology "Maugeri" Foundation, IRCCS Cassano, Italy*

To evaluate whether in the early phase of hypertension (H) left ventricular diastolic impairment is associated with an abnormal autonomic control, 47 newly diagnosed mild to moderate never treated H pts (45 ± 11 yrs) underwent 2D-echo-doppler assessing: left ventricular diastolic function (early/atrial filling ratio corrected for heart rate; E/A, normal value > 1). The autonomic balance was evaluated by means of heart rate (RR) and systolic blood pressure (BP) variabilities in the frequency domain with autoregressive method from 10-min ECG recordings at rest, controlled respiration (16 b/m', CR) and tilt. Low frequency (LF), high frequency (HF) and total power (TP) were calculated. Fifteen pts had an E/A < 1; 32 an E/A > 1.

	E/A < 1			E/A > 1		
	Rest	CR	Tilt	Rest	CR	Tilt
TP-RR	6.7 ± 0.9	6.7 ± 0.9	6.7 ± 0.9	7.3 ± 0.7	6.9 ± 0.7	6.9 ± 0.7
LF-RR	4.9 ± 1.8*	4.8 ± 1.2*	4.6 ± 1.7*	5.6 ± 0.9	5.1 ± 0.9	5.6 ± 1.0
LF-BP	1.5 ± 0.8	1.6 ± 1.0	2.7 ± 0.9	2.0 ± 1.1	1.5 ± 0.9	2.7 ± 1.0
HF-RR	4.2 ± 1.4*	4.5 ± 1.4	3.8 ± 1.6	4.9 ± 1.2	5.0 ± 1.1	4.1 ± 1.1

*p < 0.01 as compared to E/A > 1

SBP values were similar in the 2 groups. While LF-BP similarly increased during tilt in the 2 groups (p < 0.05 vs rest), LF-RR increased only in pts with E/A > 1 (p < 0.05 vs CR). These results show that in an early phase of H the diastolic impairment is associated with reduction in vagal tone and with an impaired regulation of heart rate during orthostathic stress.

965-99 The Correlation of Left Ventricular Mass and QT Dispersion in Hypertensive Patients

K. Ichkhan, J. Molnar, J. Somberg. *FUHS/The Chicago Medical School, North Chicago, IL, USA*

QT dispersion (QTd), an index of a heterogeneity in ventricular repolarization, is defined as the difference between the maximum and minimum QT interval, occurring in any of the 12 leads in an electrocardiogram. QTd is a reflection of the regional variation in ventricular repolarization and is believed to be a predictor regarding risk for ventricular tachycardia and fibrillation. Left ventricular hypertrophy is a powerful predictor of cardiac arrhythmias. The aim of this study was to evaluate the correlation between QT dispersion and left ventricular hypertrophy (LVH) in patients with hypertension. Forty-nine patients with diagnosis of hypertension were studied. Group one patients included those with hypertension and echocardiographic criteria for LVH and group two included patients with hypertension but without LVH. QTd, corrected QTd (QTdc) and left ventricular mass were calculated for all patients. A significant correlation also existed between the QTdc and the left ventricular mass (r = 0.81, p < 0.001). Patients with hypertension and LVH had a mean QTd of 58 ± 17 while patients with hypertension but without LVH had a mean QTd of 39 ± 14 (p < 0.001). Thus, a significant correlation exists between QTd and LVH. We conclude that patients with hypertension and LVH have a significantly greater QTd than patients with hypertension without LVH. This finding supports the concept that LVH increases the propensity to sustain a ventricular arrhythmia through the mechanism of increased dispersion in repolarization.

965-100 Comparison of Dobutamine Stress Echocardiography and 99m-Technetium Sestamibi SPECT Myocardial Perfusion Scintigraphy for the Diagnosis of Coronary Artery Disease in Hypertensive Patients

A. Elhendy, J.R.T.C. Roelandt, M.L. Geleijnse, R.T. van Domburg, P.R. Nierop, G.M. El-Said, M.M. Ibrahim, M. El-Refaee, P.M. Fioretti. *Thoraxcenter, Rotterdam, The Netherlands*

Background: Stress echocardiography was reported as an accurate method for the diagnosis of coronary artery disease (CAD) in hypertensive patients. In contrast, the specificity of myocardial perfusion scintigraphy in these patients was questioned. However, these imaging modalities have not been compared in hypertensive patients with or without left ventricular hypertrophy (LVH).

Methods: Dobutamine (up to 40 μg/kg/min) – atropine (up to 1 mg) stress echocardiography (DSE) in conjunction with 99m-technetium MIBI SPECT imaging was performed in 84 patients with systemic hypertension referred for evaluation of myocardial ischemia. Ischemia was defined as new wall motion abnormalities at DSE and reversible perfusion defects at SPECT.